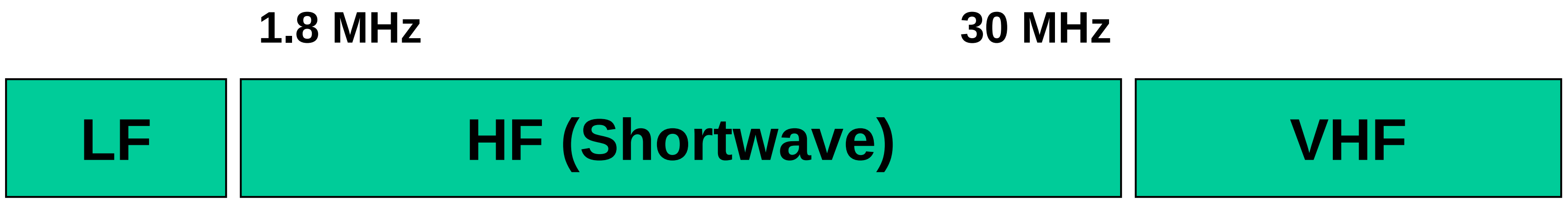
High Frequency 101

Jim Hadlock K7WA

Where to Begin? Listening

Where to Listen?



1.8 MHz

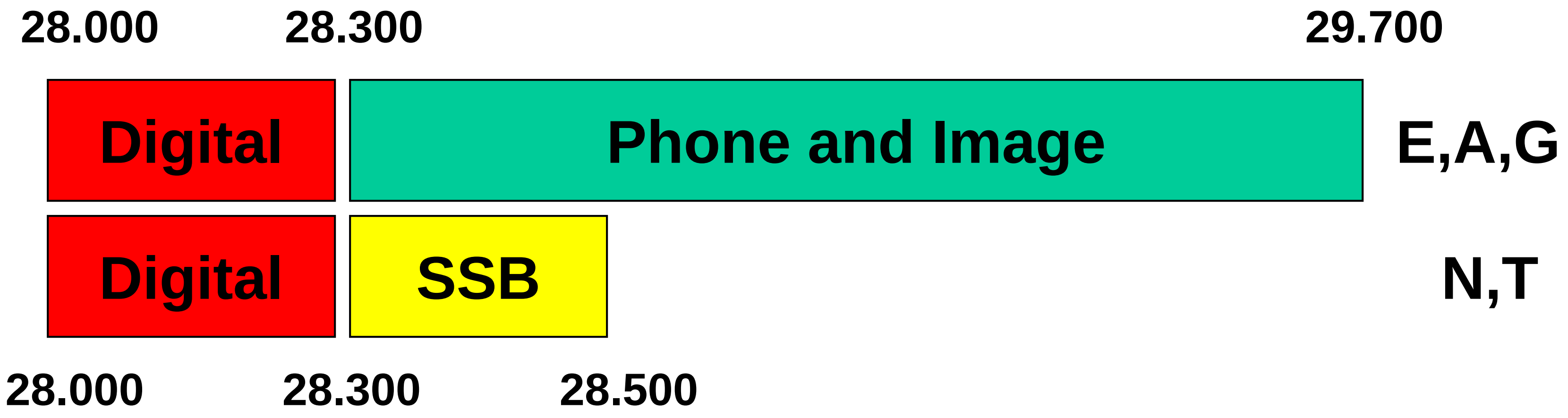
30 MHz

LF

HF (Shortwave)

VHF

Example: **10 Meter Band (28 to 29.7 MHz)**



28.000

28.300

29.700

Digital

Phone and Image

E,A,G

Digital

SSB

N,T

28.000

28.300

28.500

Kinds of Signals

- FM (Frequency Modulated Voice)
- AM (Amplitude Modulated Voice)
- SSB (Single Sideband Voice)
- CW (Continuous Wave Morse Code)
- Digital Modes (Computer to Computer)

What You Can Do

- Nets and Interest Groups
- Random Contacts – Rag Chewing
- DX (Long Distance)
- QSL (Confirmation Cards) and Awards
- Operating Activities

Nets and Interest Groups

Washington State Emergency Net:

Mondays, 6:30 PM on 3.985 MHz (alternate 7.245 MHz)

Saturdays, 9:00 AM on 3.985 MHz (alternate 7.245 MHz)

TenTen

QRP Amateur Radio Club International

Weather Nets

Yachting Nets

County Hunters

DX Nets

Random Contacts “Rag Chewing”

CQ CQ CQ (Seek You)

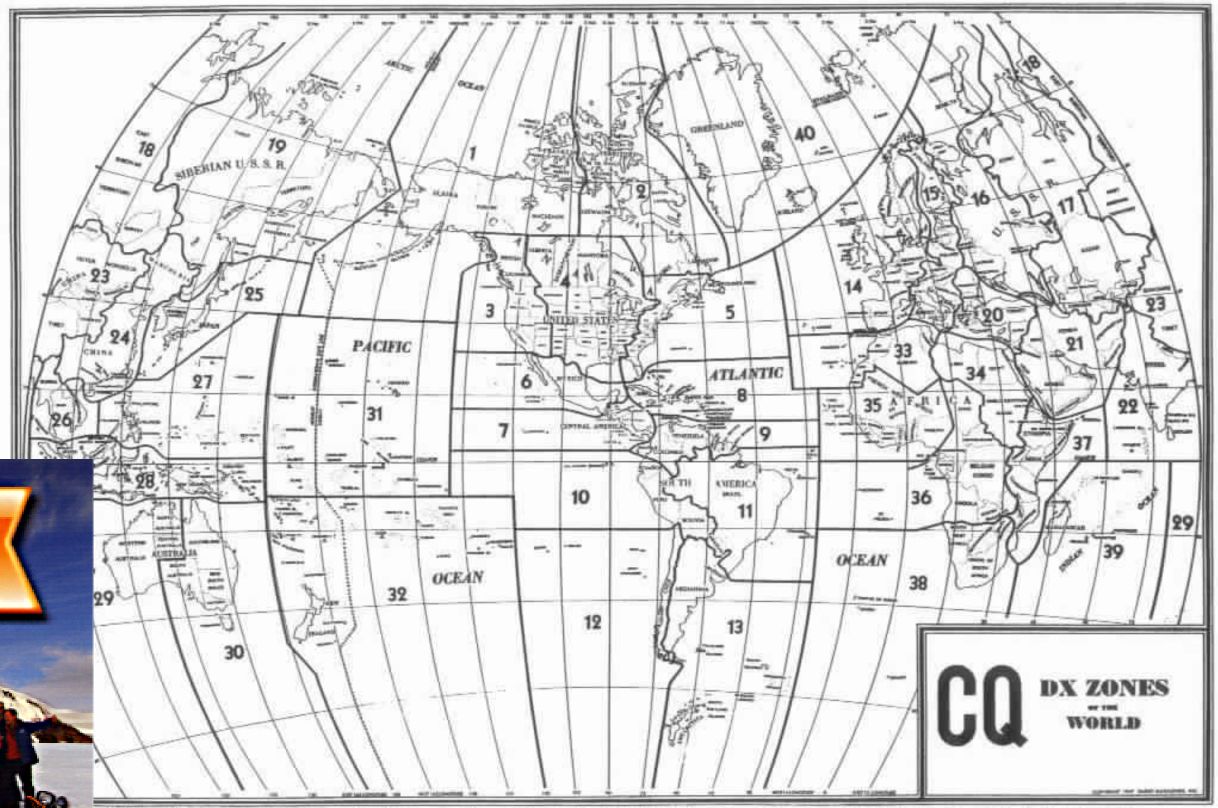
Call CQ or Answer a CQ?

Then What?

“Signal Report, Location, Name”
“Equipment, Weather, etc”
(Sometimes a real conversation starts!)

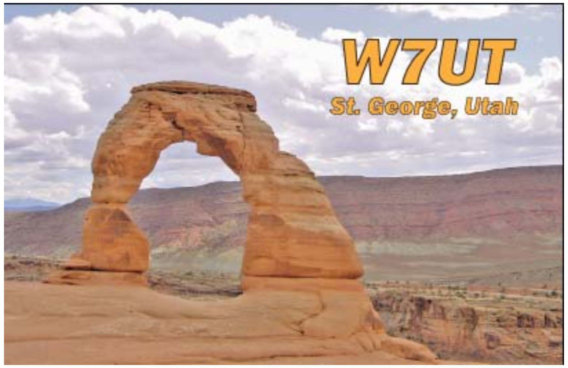
“5-9 Thankyou”

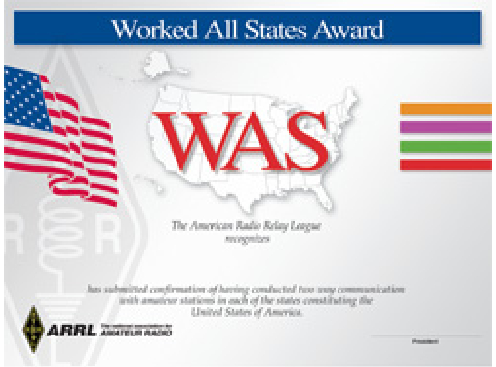
DX (Long Distance)



NOTE: This map is a reproduction of the official 1947 CQ WAZ map, and is intended to be used for general reference only. Over the years numerous adjustments have been made to Zone boundaries for various reasons. Always consult the latest CQ WAZ Rules for the most up-to-date Zone delineations.

QSL (Confirmation) Cards and Awards




Worked All States Award

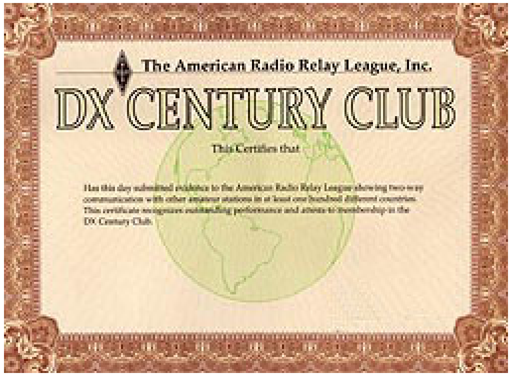
WAS

The American Radio Relay League recognizes

has submitted confirmation of having conducted two way communication with amateur stations in each of the states constituting the United States of America.

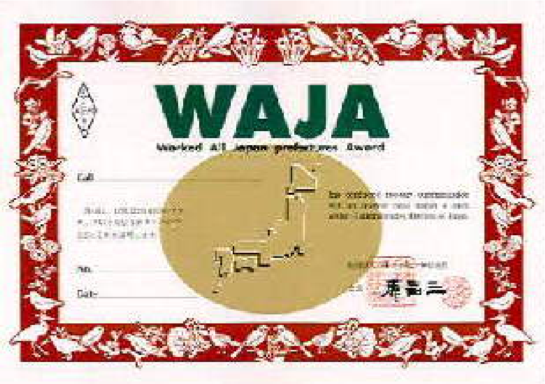
ARRL

President


The American Radio Relay League, Inc.

DX CENTURY CLUB

This Certifies that

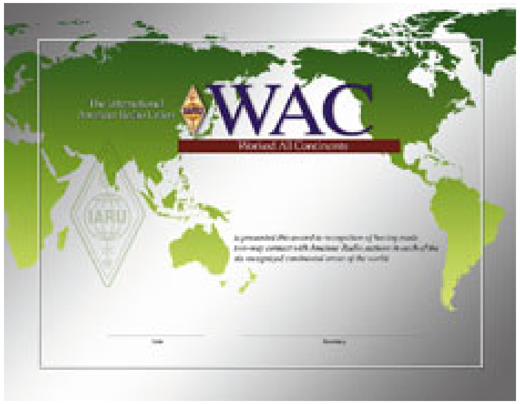

WAJA

Worked All Japan prefectures Award

Call

No.

Date


WAC

Worked All Continents

Operating Activities

Club Activities – Nets, Code Practice, Chat

Special Events (Indy 500, Centennials, etc.)

Emergency Exercises (Simulated Emergency Test)

ARRL Field Day

State QSO Parties – Washington Salmon Run

Other Contests

ARRL Field Day

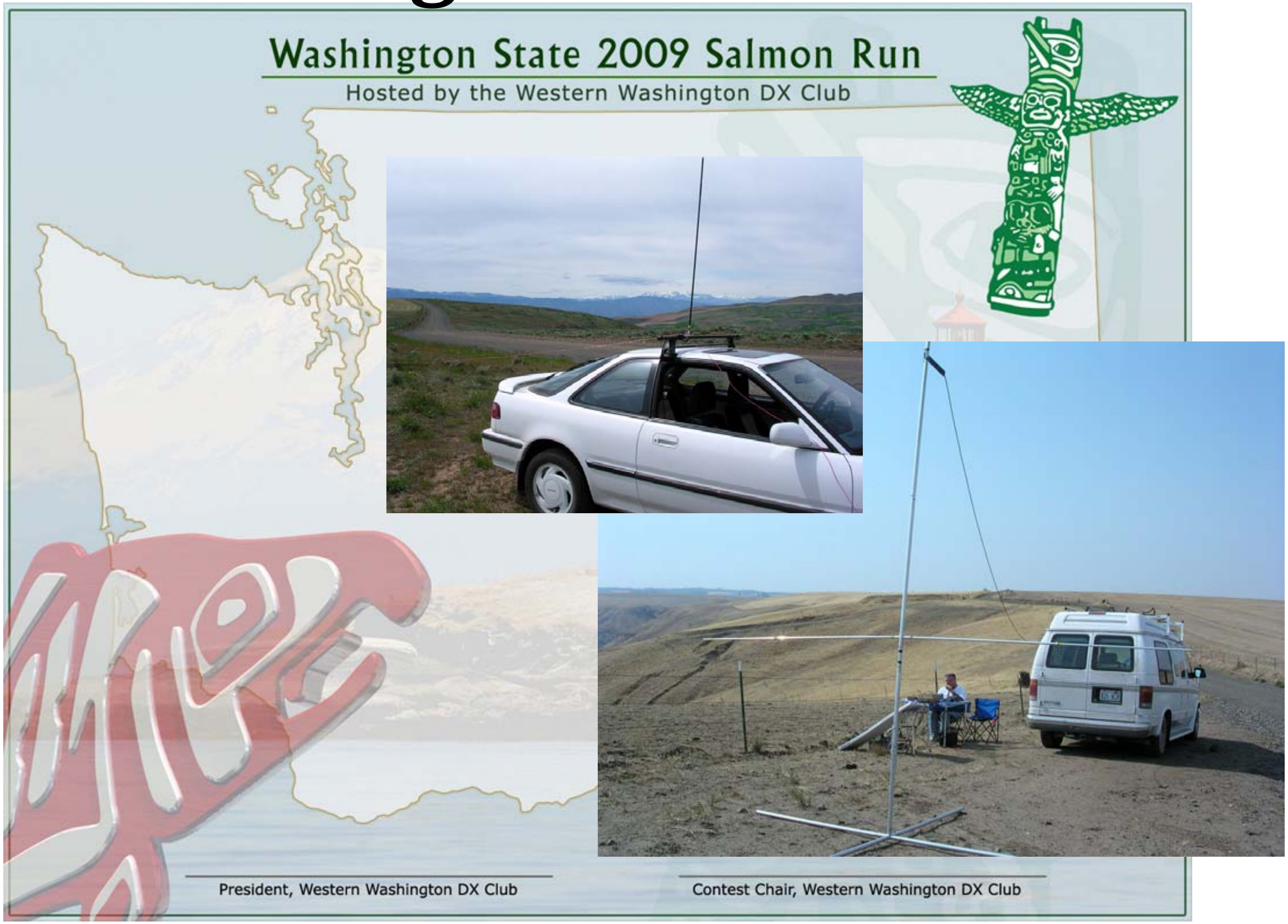
Last full weekend of June

Emergency Exercise

See Ham Radio in Action

Popular Club Activity

Washington Salmon Run



Washington State 2009 Salmon Run

Hosted by the Western Washington DX Club

President, Western Washington DX Club

Contest Chair, Western Washington DX Club

Meters and Megahertz

$$\textbf{Wavelength (meters)} = \frac{\textbf{300,000,000 meters/second}}{\textbf{Frequency Hz}}$$

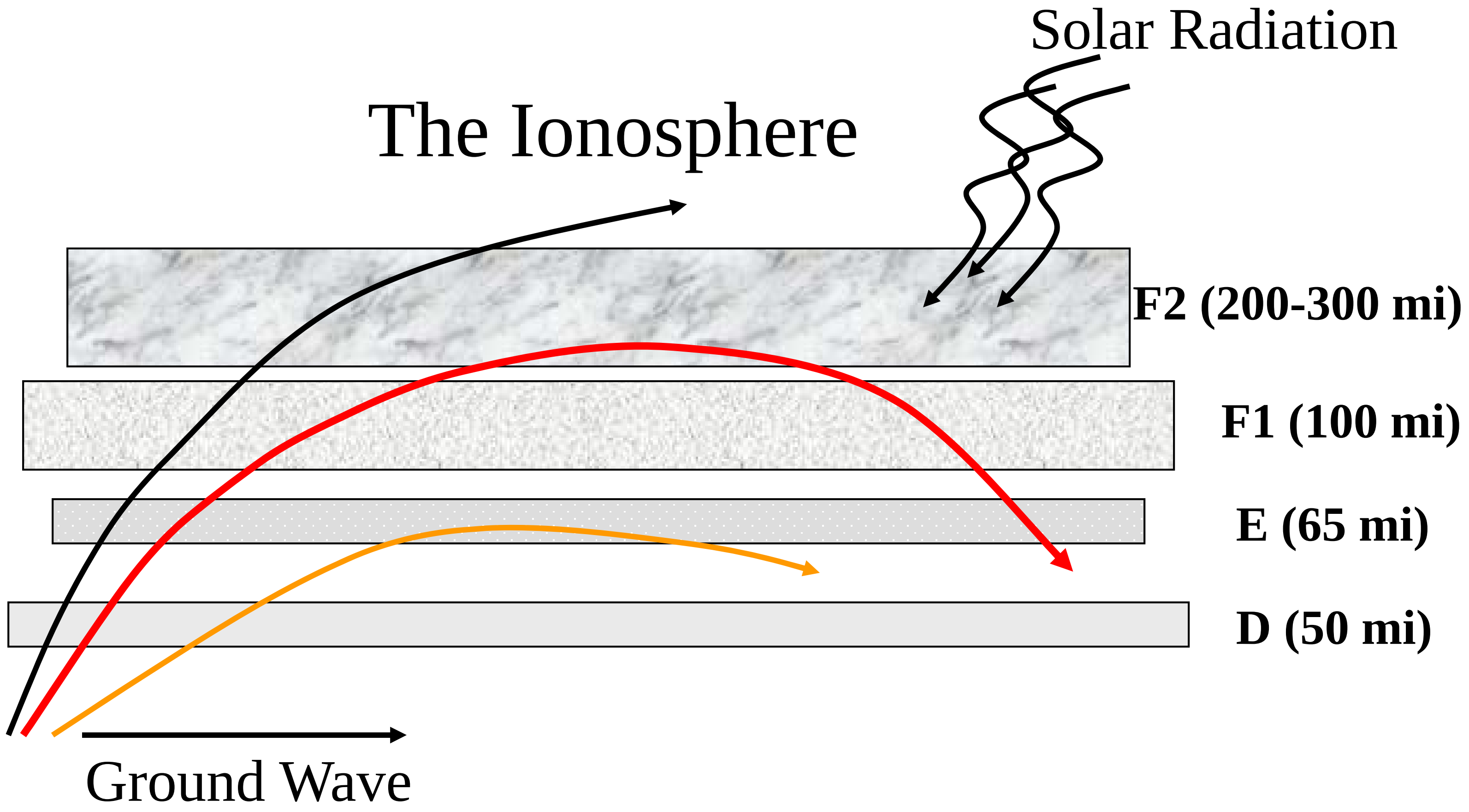
Examples:

2 Meter Band – 144 to 148 MHz

10 Meter Band – 28.0 to 29.7 MHz

"Think of the BAND as the neighborhood and the FREQUENCY as the address"

High Frequency Propagation



Propagation Cycles

11 Year Solar Cycle:

Has been observed since the 1600s
Cycle 24 is just beginning
Solar Effects are the biggest influences on the Ionosphere

Annual (Seasonal) Cycle:

Caused by the tilt of the earth’s axis
Long nights favor the Low Bands
Long days favor the High Bands

Daily Cycle:

Darkness favors the Low Bands
Daylight favors the High Bands
Gray Line propagation produces interesting effects

Low Bands

160 Meters (1.800 to 2.000 MHz)

80 and 75 Meters (3.500 to 4.000 MHz)

60 Meters (5.3305, 5.3465, 5.3665, 5.371.5, 5.4035 MHz)

40 Meters (7.000 to 7.300 MHz)

Local coverage during daylight, continental to worldwide coverage during darkness, best with quiet geomagnetic activity, regional “chat” and Nets on 75 Meter SSB. Antennas need to be large and high for maximum performance.

Mid Bands

30 Meters (10.100 to 10.150 MHz)

20 Meters (14.000 to 14.350 MHz)

17 Meters (18.068 to 18.168 MHz)

North America to worldwide coverage during daylight, 20 Meters is the most popular and crowded band, best with improving sunspot activity.

High Bands

15 Meters (21.000 to 21.450 MHz)

12 Meters (24.890 to 24.990 MHz)

10 Meters (28.000 to 29.700 MHz)

North America to worldwide coverage during daylight, best with high sunspot activity, Novice and Technician SSB allocation on 10 Meters (28.300 to 28.500 MHz). Short wavelength makes "gain" antennas manageable.

Assembling an HF Station

“Keep it Simple – Have Fun”

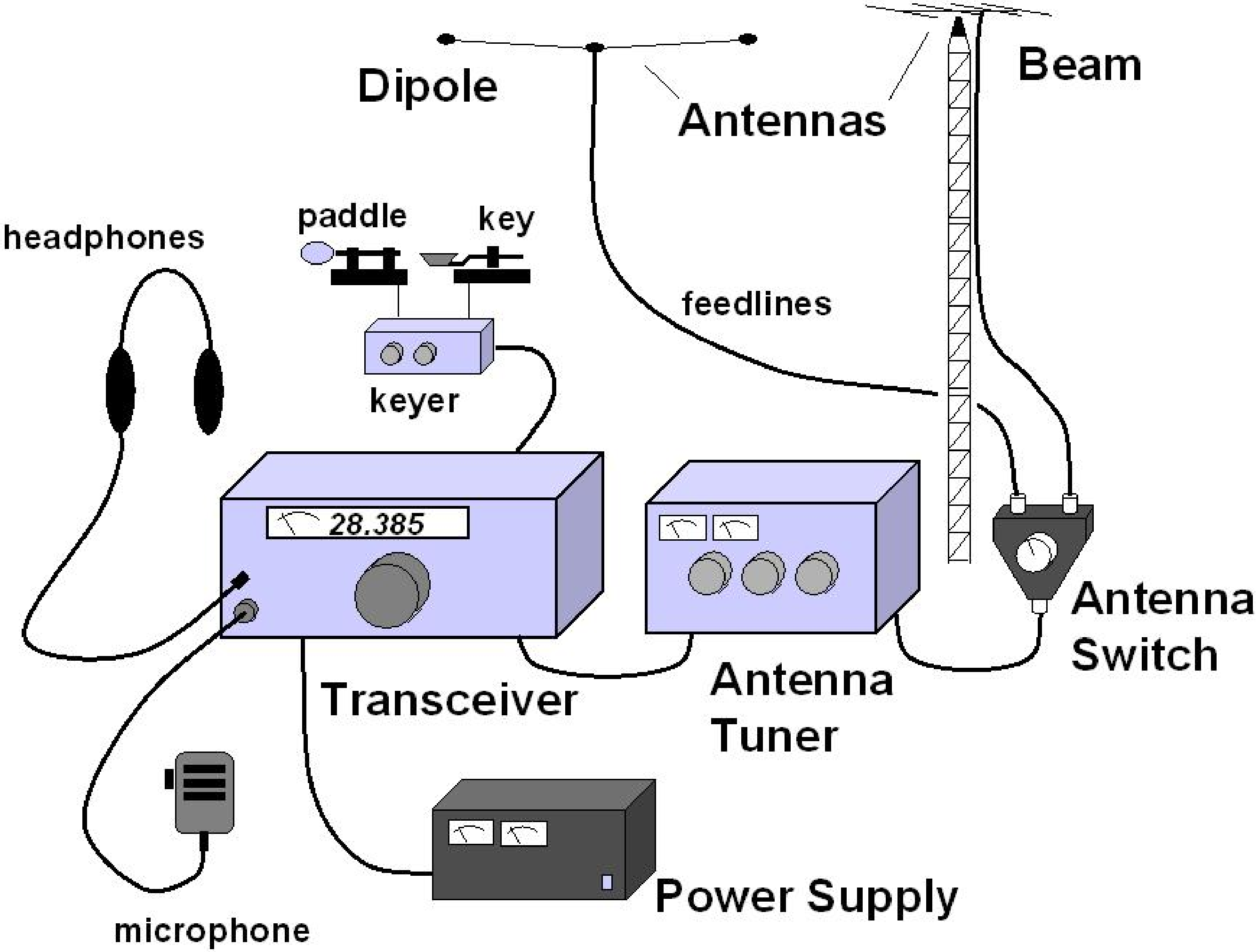
What Do You Want to Do?

Frequency Bands?
Modes?
Random Contacts?
Long Distance Contacts?
Nets?

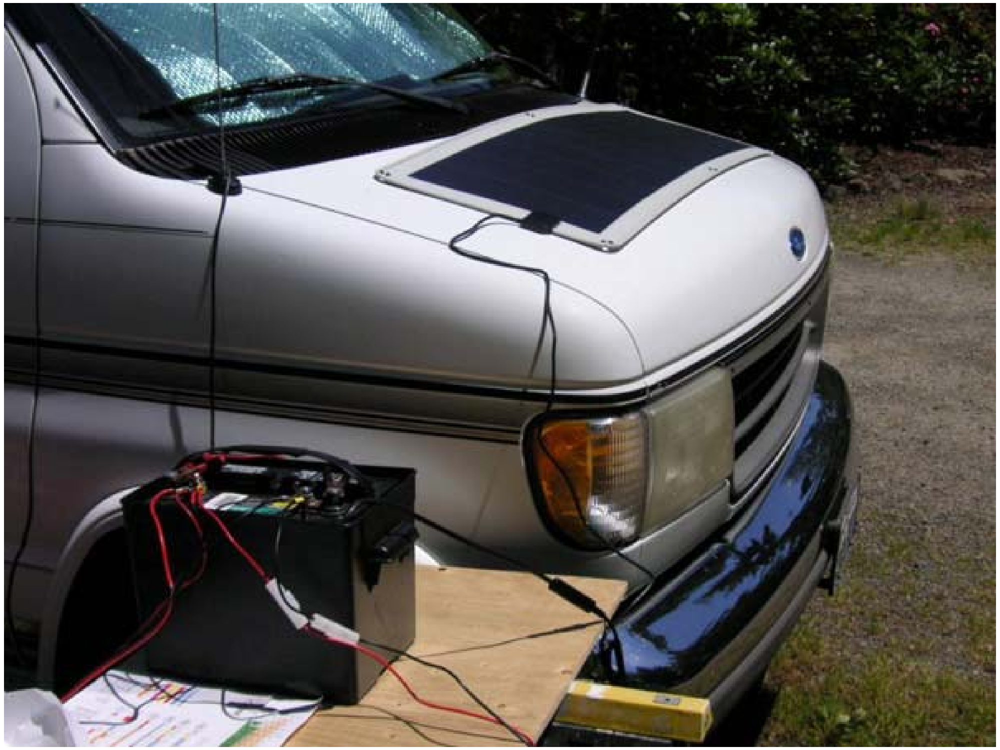
How Much Room Do You Have for Antennas?
How Much Do You Want to Spend?

"Keep it Simple – Have Fun"

What Kind of Gear Do I Need?



Power Sources



ASTRON
CORPORATION
ASTRON SS-30M
All Metered Units
Now With Backlit Displays
PREMIER MANUFACTURER OF: DC-DC Converters • DC-AC Inverters
Power Supplies • Battery Chargers

Radios

YAESU
HF/VHF/UHF ALL MODE TRANSCEIVER FT-897
21.295.00
www.rigpix.com

14.195.700
www.rigpix.com

KENWOOD
14200.00
448.525.00
www.rigpix.com

Radios – New or Used

Frequency Coverage (WARC Bands)

Power Requirement (12 VDC?)

Digital Capabilities

Working Condition

If you're a Beginner, get a second opinion

Radios – Kits

Low Power (QRP)

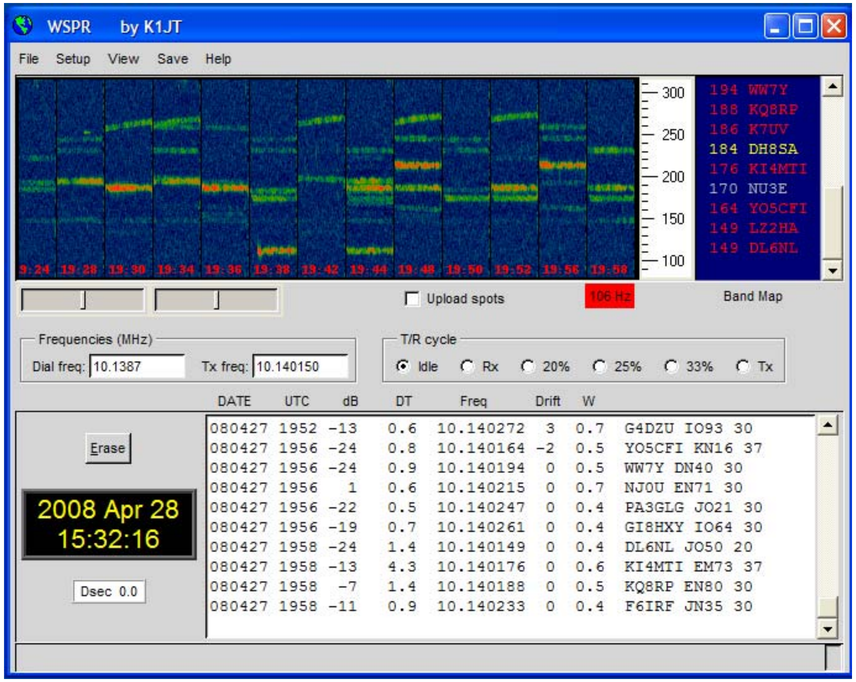
Often CW only

Can be challenging to build

Digital Interface

Utilizes PC Soundcard to Generate and Decode RTTY, PSK, Packet, and Other Digital Modes

- Digi-Pan
- WSJT
- MM-TTY



```
194 WW7Y
188 KQ8RP
186 K7UV
184 DH8SA
176 KI4MTI
170 NU3E
164 YO5CFI
149 LZ2HA
149 DL6NL
```

☐ Upload spots

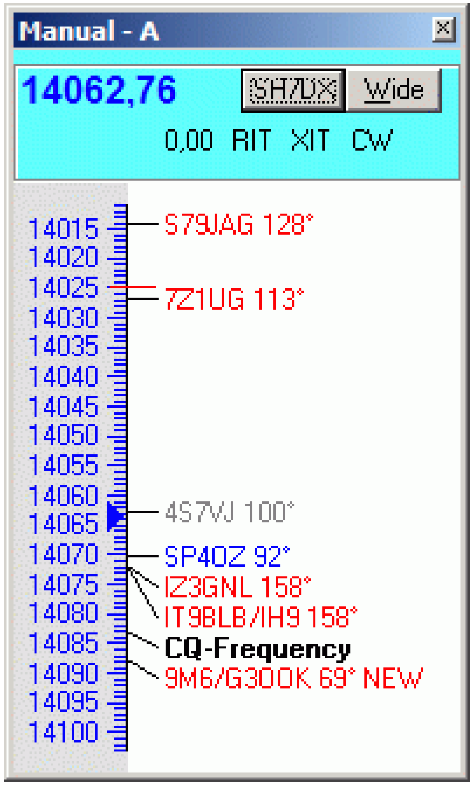
Frequencies (MHz)
Dial freq: 10.1387 Tx freq: 10.140150

T/R cycle
● Idle ○ Rx ○ 20% ○ 25% ○ 33% ○ Tx

2008 Apr 28
15:32:16

```
DATE   UTC   dB   DT    Freq      Drift W
080427 1952 -13   0.6  10.140272  3   0.7   G4DZU IO93 30
080427 1956 -24   0.8  10.140164 -2   0.5   YO5CFI KN16 37
080427 1956 -24   0.9  10.140194  0   0.5   WW7Y DN40 30
080427 1956   1   0.6  10.140215  0   0.7   NJ0U EN71 30
080427 1956 -22   0.5  10.140247  0   0.4   PA3GLG JO21 30
080427 1956 -19   0.7  10.140261  0   0.4   GI8HXY IO64 30
080427 1958 -24   1.4  10.140149  0   0.4   DL6NL JO50 20
080427 1958 -13   4.3  10.140176  0   0.6   KI4MTI EM73 37
080427 1958  -7   1.4  10.140188  0   0.5   KQ8RP EN80 30
080427 1958 -11   0.9  10.140233  0   0.4   F6IRF JN35 30
```

Computer Control

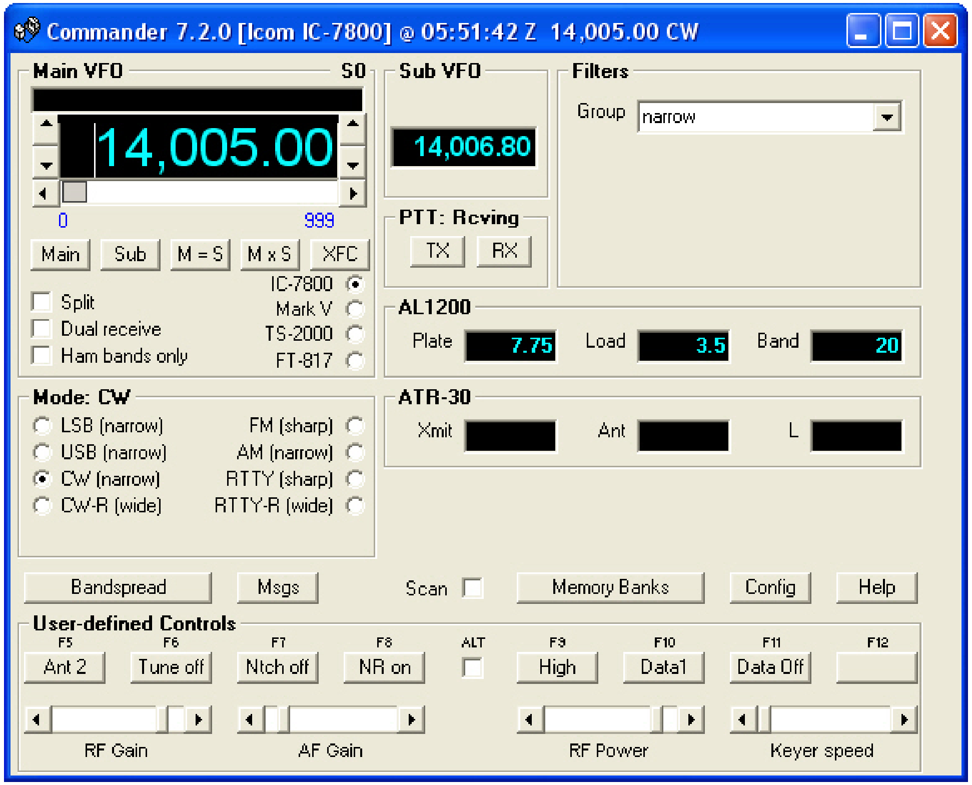


14062,76

0,00

S79JAG 128°
7Z1UG 113°
4S7VJ 100°
SP4OZ 92°
IZ3GNL 158°
IT9BLB/IH9 158°
CQ-Frequency
9M6/G3OOK 69° NEW

N1MM



Commander 7.2.0 [Icom IC-7800] @ 05:51:42 Z 14,005.00 CW

Main VFO: 14,005.00

Sub VFO: 14,006.80

Group: narrow

● IC-7800
○ Mark V
○ TS-2000
○ FT-817

☐ Split
☐ Dual receive
☐ Ham bands only

Mode: CW

○ LSB (narrow)
○ USB (narrow)
● CW (narrow)
○ CW-R (wide)
○ FM (sharp)
○ AM (narrow)
○ RTTY (sharp)
○ RTTY-R (wide)

AL1200

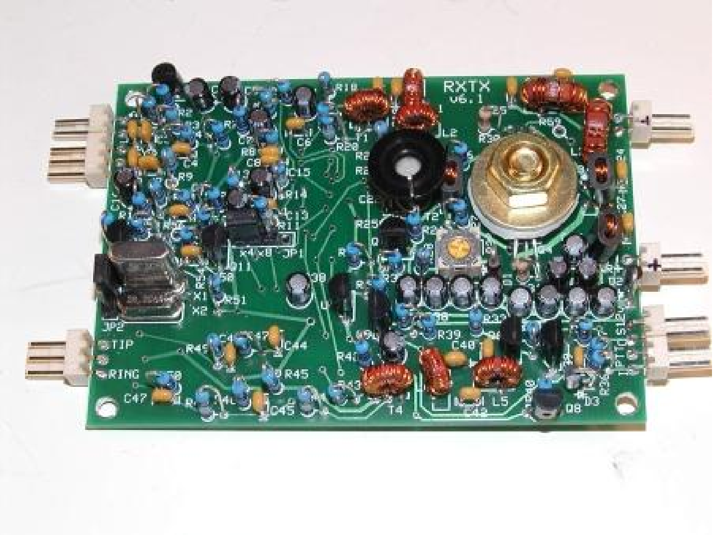
Plate 7.75
Load 3.5
Band 20

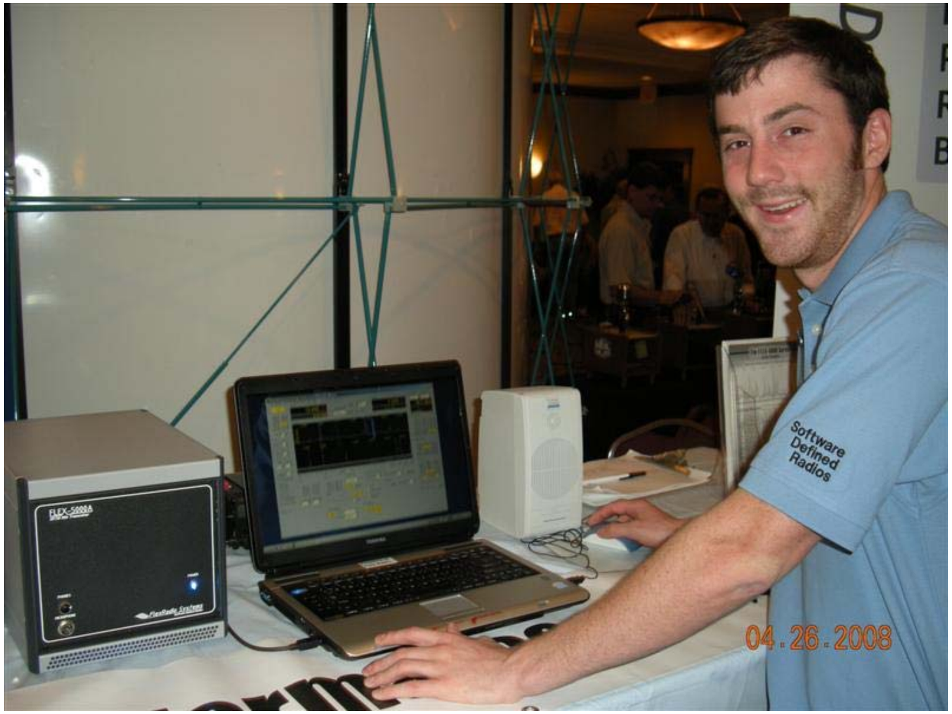
ATR-30

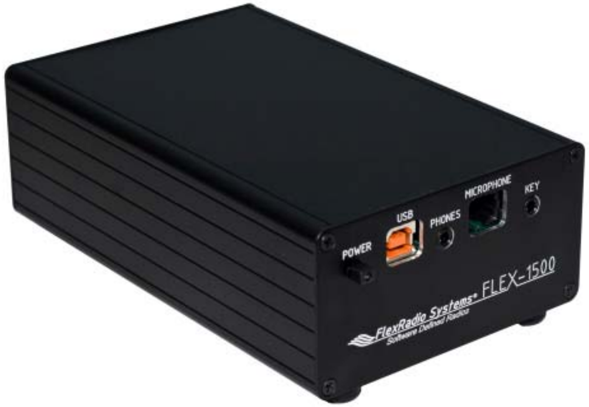
Xmit
Ant
L

DX Lab

SDR (Software Defined Radio)







Softrock (Kits), FlexRadio

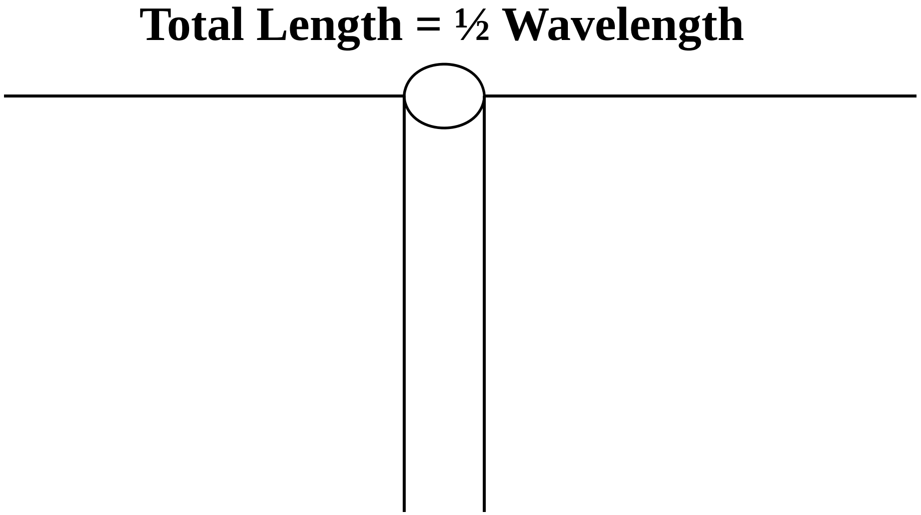
Amplifiers

1500 Watts Maximum
Requires Dedicated 220 VAC Line
Potential RFI (Interference) Problems

Antennas

"Keep it Simple – Have Fun" … and Be Safe!

Half Wave Dipole



Horizontal Pattern: Figure 8
Vertical Pattern: Depends on Height

Antenna Wire, Feedline, and Insulators

Examples:

Zip Cord Dipoles

Folded Dipole (300 Ohm TV “Ribbon Line”)

Dipole with “Window Line”

Dipole with Balun and Coaxial Cable

Coaxial Cable Basics

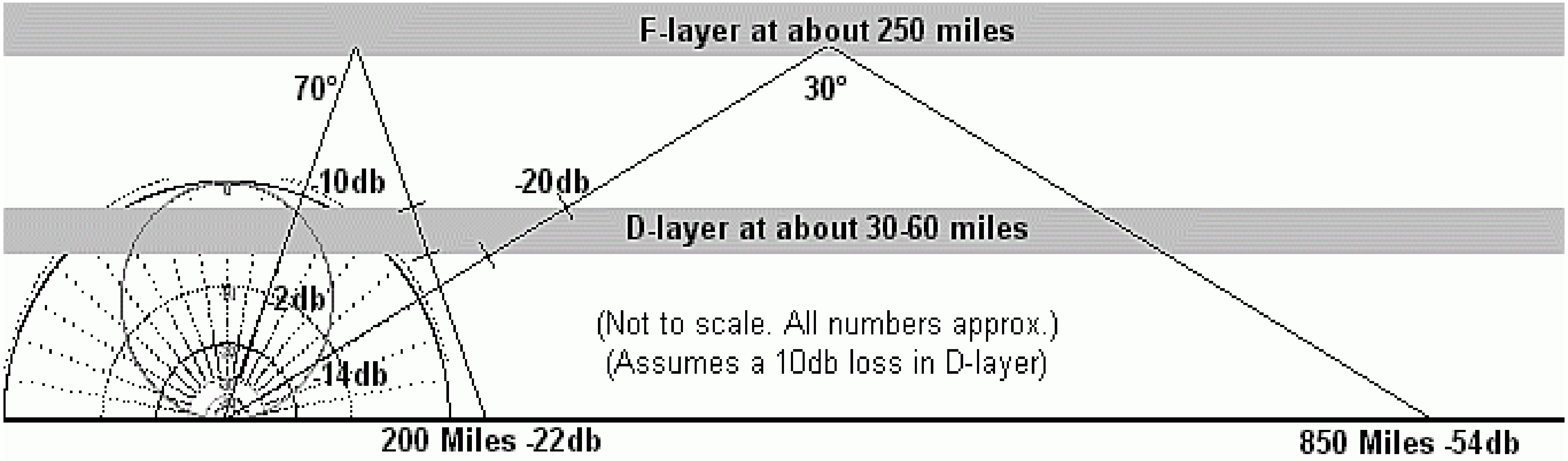
Antenna Tuners

Match the Transmitter to the Load

Transmitter (Coax) to:
Coax
Twinlead
Single Wire

NVIS

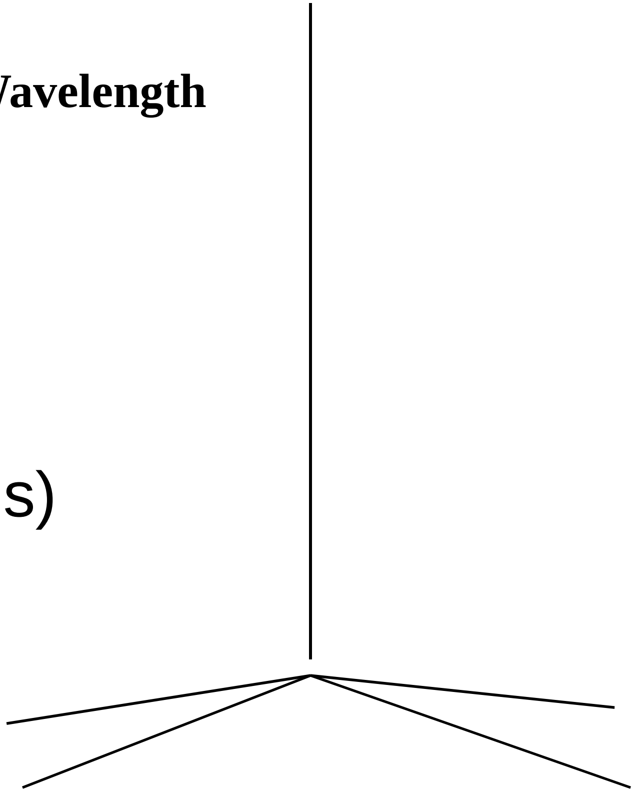
(Near Vertical Incident Skywave)


F-layer at about 250 miles
70°
30°
-10db
-20db
D-layer at about 30-60 miles
-2db
-14db
(Not to scale. All numbers approx.)
(Assumes a 10db loss in D-layer)
200 Miles -22db
850 Miles -54db

Propagation – "Critical Frequency"

High Angle Antenna – Approximately ¼ Wavelength Above the Ground

Quarter Wave Vertical



Total Height = ¼ Wavelength

Horizontal Pattern: Circle
Vertical Pattern: Low
(Efficiency Depends on Radials)

Multi - Band Antennas

G5RV (Non-resonant Dipole)

Trap Antennas

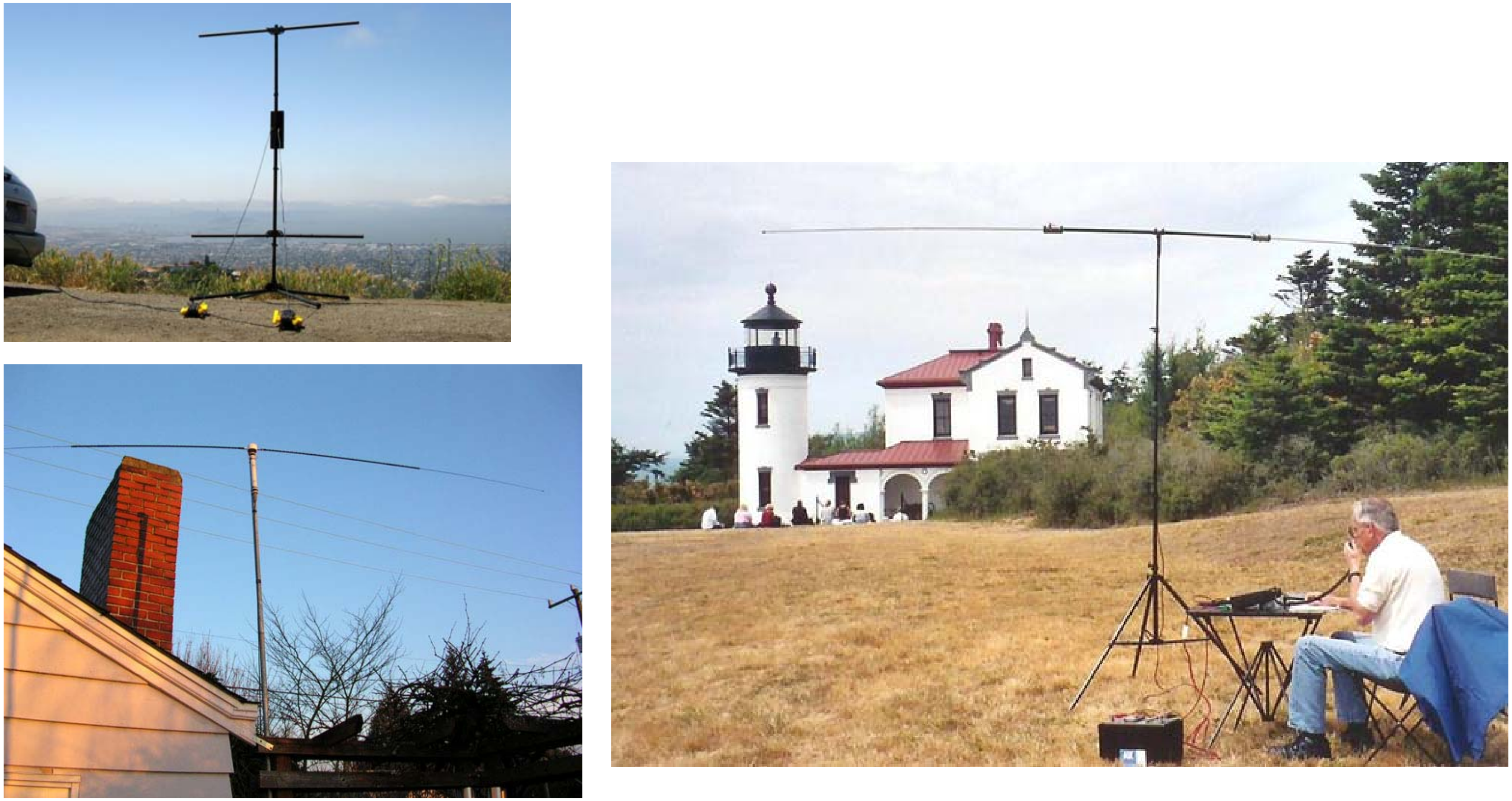
Other Methods

Allow multi-band operation, but are usually more complex and less efficient than a single-band antenna.

(be suspicious of claims that seem too good to be true!)

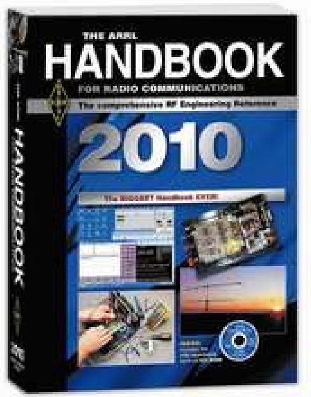
Compact Antennas

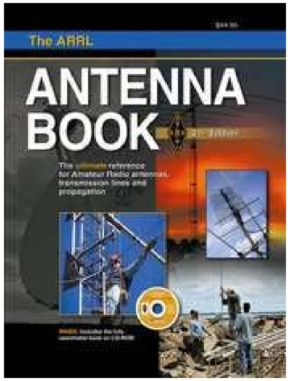
Beware of “Miracle Antenna Claims”

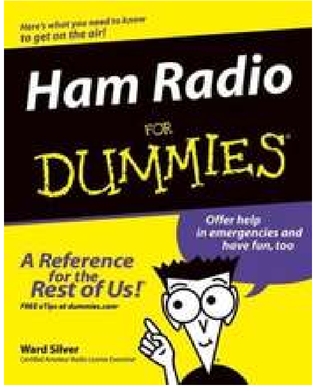


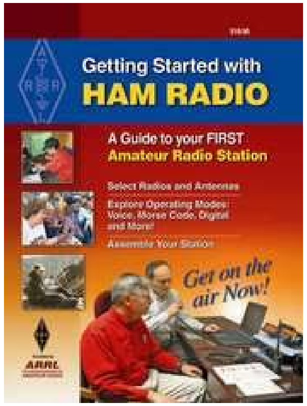
For More Information:

- Amateur Radio Clubs
- Find an “Elmer”
- Books and Magazines
- The Internet (www.arrl.org)

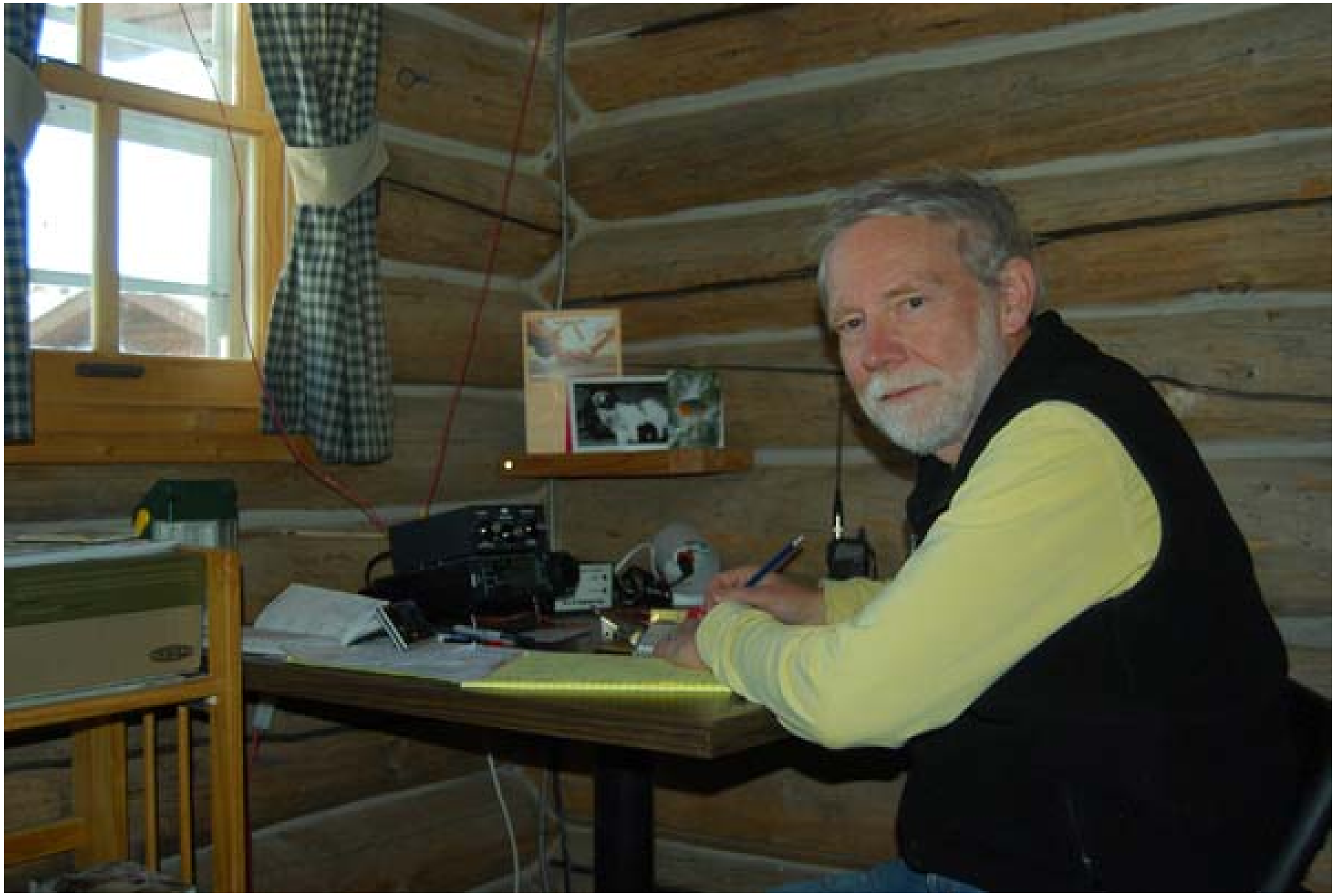





Ham Radio
FOR
DUMMIES
A Reference for the Rest of Us!
Offer help in emergencies and have fun, too
Ward Silver


Getting Started with
HAM RADIO
A Guide to your FIRST Amateur Radio Station
Select Radios and Antennas
Explore Operating Modes: Voice, Morse Code, Digital and More!
Assemble Your Station
Get on the air Now!
ARRL

Thank You!



k7wa (at) arrl.net